

Increasing the Performance of Autonomous Planetary Robots Through Environmental Manipulations, Phase I

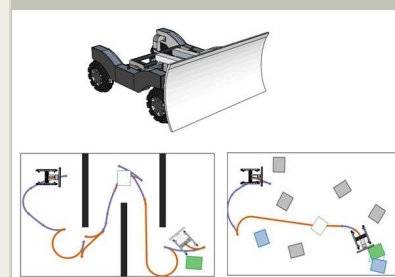
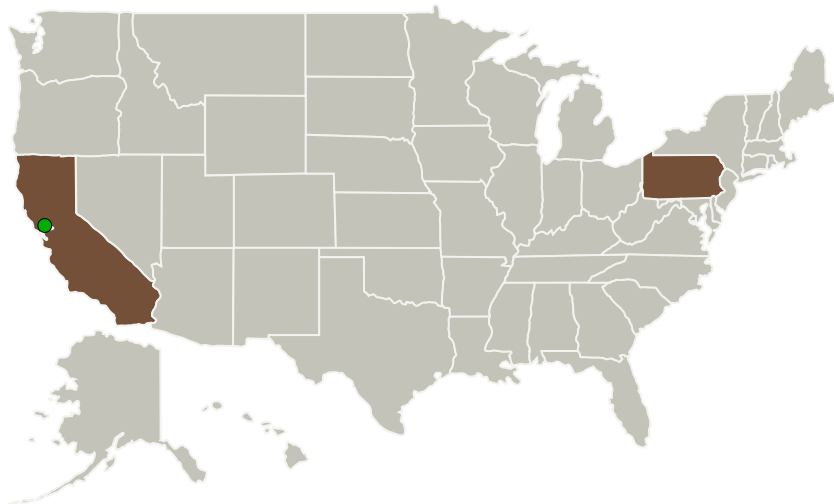
Completed Technology Project (2016 - 2017)



Project Introduction

ProtoInnovations, LLC and Carnegie Mellon University propose to research, design, develop, and test software tools and hardware that will greatly increase the performance of planetary robots by manipulating the environment around them. We are specifically interested in developing new planning algorithms and non-prehensile manipulation techniques and simple robotic tools that will allow rovers to alter the environment around them for the purposes of creating feasible navigation routes, accessing interesting scientific targets, or doing some basic terraforming. A robot could be endowed with dedicated hardware to enable this terrain manipulation. Six or seven degree-of-freedom manipulator arms are commonly used for moving objects around a robot's environment. However adding such specialized, high torque, environmentally-toughened hardware adds significant costs in terms of fabrication, flight weight, and power requirements. Instead, in this proposal we will take advantage of the existing affordances of the platform in order to rearrange the terrain with no, or little, added hardware.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Protoinnovations, LLC	Lead Organization	Industry	Pittsburgh, Pennsylvania
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Carnegie Mellon University	Supporting Organization	Academia	Pittsburgh, Pennsylvania

Primary U.S. Work Locations	
California	Pennsylvania

Project Transitions

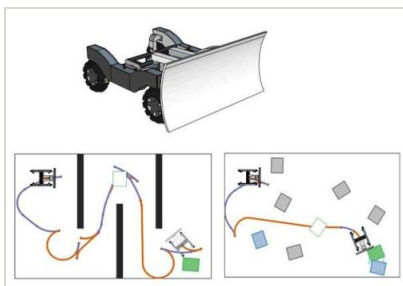
▶ **June 2016:** Project Start

✓ **June 2017:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139746>)

Images



Briefing Chart Image

Increasing the Performance of Autonomous Planetary Robots Through Environmental Manipulations, Phase I

(<https://techport.nasa.gov/image/133092>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Protoinnovations, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

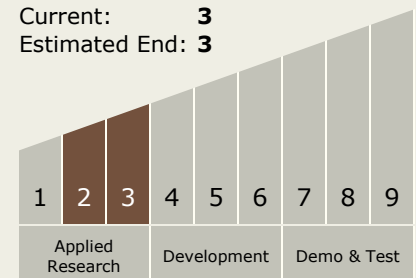
Carlos Torrez

Principal Investigator:

Siddhartha Srinivasa

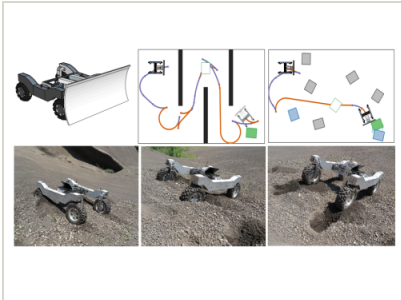
Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



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Final Summary Chart Image

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Image

(<https://techport.nasa.gov/image/127254>)

Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.3 Manipulation
 - └ TX04.3.2 Grappling Technologies

Target Destinations

Earth, The Moon, Others Inside
the Solar System, Outside the
Solar System, The Sun, Mars